Dead Zones

Hypoxia in the Gulf of Mexico

National Oceanic and Atmospheric Administration • United States Department of Commerce

Also known as a Dead Zone, hypoxia occurs when there is not enough oxygen in the water to support aquatic life.

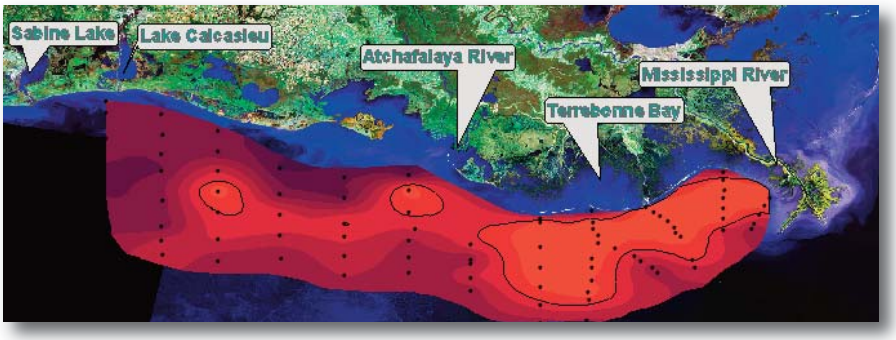
What is Hypoxia

Hypoxia in aquatic systems refers to waters where the dissolved oxygen concentration is below 2 mg/L, a level at which most organisms become physiologically stressed or cannot survive. Creating what is often known as a "dead zone" hypoxia also can kill marine organisms that cannot escape the low-oxygen water, affecting commercial harvests and the health of affected ecosystems.

How Large is the Gulf of Mexico Dead Zone?

The size of dead zones fluctuates throughout any given year with the largest dead zones appearing in summer months. The hypoxic area in the Gulf of Mexico has more than doubled in size since the late 1980s. Initial forecasts for the size of the 2009 dead zone in the Gulf estimated it to be around 7,500 - 8,500 square miles, however scientists found the dead zone to be 3,000 square miles.

The result appears hopeful as on average the size of the dead zone is estimated to be 6,000 square miles. However this smaller than expected result is believed to be related to short-term weather patterns before measurements were taken and not a reduction in excessive nutrient runoff. The largest dead zone on record occurred in 2002, measuring 8,484 square miles.



Hypoxia in the northern Gulf of Mexico. Credit: LUMCON

The Dead Zone's Effect on the Gulf of Mexico

The NOAA Ship Oregon II, *used for the Gulf of Mexico Hypoxia Watch. Credit: NOAA*

The Gulf of Mexico dead zone is of particular concern because it threatens valuable commercial and recreational Gulf fisheries that generate about $2.8 billion annually. Catches of brown shrimp, one of the most commercially valuable species in the Gulf, has decreased since the late 1970s. Based on experiences in other coastal and marine systems, worsening hypoxic conditions could lead to a serious decline of ecologically and commercially important species.

How do Gulf Dead Zones Occur?

Forty-one percent of the continental United States (1.2 million square miles) drains into the Mississippi River and then out to the Gulf of Mexico.

The majority of the land in Mississippi's watershed is farm land. Seventy percent of nutrient loads that cause hypoxia are a result of agricultural runoff caused by rain washing fertilizer off of the land and into streams and rivers. Additionally, 12 million people live in urban areas that border the Mississippi, and these areas constantly discharge treated sewage into rivers.

The farm and urban discharge includes nutrients such as nitrogen and phosphorous that is very important for the growth of phytoplankton. About 1.7 million tons of these nutrients are deliverd by rivers into the Gulf of Mexico every year.

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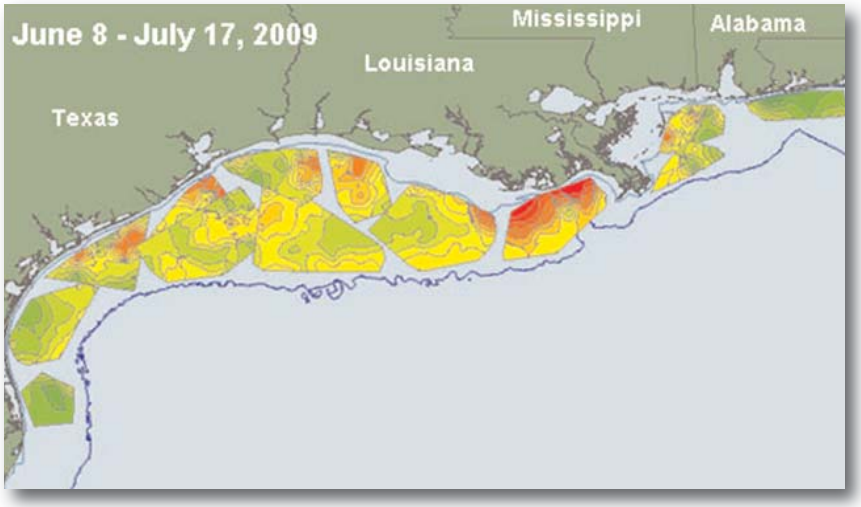
This huge influx of nutrients causes massive phytoplankton blooms to occur, this in turn leads to a large increase in zooplankton that feed on phytoplankton.

Large amounts of dead phytoplankton and zooplankton waste then accumulate on the bottom of the seabed. The decomposition of this matter depletes the oxygen in the area faster than it can be replaced. This leads to large hypoxic areas called Dead Zones.



Dissolved oxygen measurements made during the annual summer Gulf of Mexico Southeast Area Monitoring and Assessment Program cruise in the northwest and north-central Gulf of Mexico.

Gulf of Mexico Dead Zone Management & NOAA

Recent research suggests that more hypoxia is resulting from the same level of nutrients going into the water, a likely indicator of dangerous changes in system dynamics, making it harder to shrink the size of these dead zones.

Evidence indicates that since the 1993 flooding of the Mississippi River, less nutrients and freshwater inputs are required to induce a large dead zone. This scenario, where repeated hypoxic events occur, also appears to be occurring in the Chesapeake Bay and Baltic Sea.

The EPA Science Advisory Board recommends decreasing the size of these hypoxic zones by 45 percent in both nitrogen and phosphorous. The National Academies of Science also recommends significant reduction of nutrients in its 2008 report.

NOAA, with its partners, is committed to:

- Helping to identify and monitor the causes of hypoxia and determine the specific management measures required to restore ecosystem health.
- Conducting research to study the effects of hypoxia on living resources and coastal economies. This research will help natural resource managers make more informed decisions for sustaining and improving water quality monitoring in the Mississippi River watershed, the Gulf of Mexico, and the many other areas of the country experiencing hypoxia.

You can learn more about hypoxia in the Gulf of Mexico at:

NCCOS Gulf of Mexico Dead Zone Research for Management: http://www.cop.noaa.gov/stressors/extremeevents/hab/features/hypoxiafs_report1206.html

NOAA Gulf of Mexico Hypoxia Watch

http://ecowatch.ncddc.noaa.gov/hypoxia

LUMCON Hypoxia Site:

http://www.gulfhypoxia.net

University of Michigan Hypoxia Forecasting Site:

http://sitemaker.umich.edu/scavia/hypoxia_forecasts

To learn more about NOAA, visit http://www.noaa.gov.